

AB CLAUSEN

Rådgivende Ingeniører A/S

INDUSTRY

■ DESIGN SERVICES & COMPETENCES



MEDLEM AF TECH SAM GRUPPEN



Foreningen af
Rådgivende Ingeniører
FRI



MEDLEM AF
BØRSEN
GAZELLE

BØRSEN
GAZELLE /2016

BØRSEN
GAZELLE /2017

BØRSEN
GAZELLE /2018

BØRSEN
GAZELLE /2019

BØRSEN
GAZELLE /2020

ABOUT AB CLAUSEN - INDUSTRY

In AB Clausen we are passionate about design of industrial plants and structures in general, and we are focused on delivering cost-efficient high quality consultancy services to our clients. Our ambition is to become our clients' preferred partner by being honest, committed, and reliable and by providing optimized structural design services.

Our team consists of Denmark's most skilled structural engineers having strong competences within design of complex industrial structures. Our employees' references contain comprehensive experience and knowledge in managing and designing complex industrial structures in concrete and steel at an international level.

Design of industrial structures are, when beneficial from a technical and commercial point of view, solved in collaboration with a well-

established network of foreign based design partners to reduce the overall costs for the benefit of our clients and to have the power to hand over detailed design in a continuous flow often required in complex industrial projects. Our clients will always have one point of contact only.



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OUR VALUES

It is our values that define us and guide the individual employee's own development, as well as the collaboration with customers and stakeholders. Our values, and the behavior you will experience, are briefly described below:

PROFESSIONALISM

- We deliver on time, in agreed quality and economy!
- We are proactive and seek to optimize on all parameters
- We are transparent about risks with clear mitigation plans

PASSION

- We want to make a difference and make things work
- We go into detail and constantly develop our professionalism
- We are curious to find new and creative solutions
- We are socially responsible and always show the highest integrity in our work

HUMOR

- We create a constructive atmosphere where the best solutions arise
- Relationships are crucial and we create unity in all the teams we are part of
- We are unpretentious in our actions and focus on job satisfaction for all

AGILITY

- We drive and follow the latest developments in construction
- We strive to get to know the customer thoroughly and adapt to their needs
- We are powerful when we use exploit each other's strengths
- We explore, include each other and incorporate learning

DESIGN SERVICES & COMPETENCES

AB Clausen offer cost-efficient civil and structural engineering designs within industrial plants and energy plants as well as full-service consultancy for production facilities/buildings. Our services comprise project- and design management as well as engineering services based on national or international codes and standards detailed as follows:

Structural design for industrial & energy plants

Design of structures for all kind of heavy and medium heavy industrial plants or energy plants (i.e., Power Plants (wood chip, straw, waste, diesel generator, gas), factories, water treatment plants, solar plants, Boiler Buildings, Turbine Buildings etc.) often consisting of bigger main and secondary steel structures, In-situ cast reinforced concrete structures, industrial façade structures, precast reinforced concrete structures (where relevant). Where found necessary by the client AB Clausen may also undertake minor design tasks within the M&E disciplines and within design of roads, pavements, and underground utilities if this is found necessary to solve the primary structural engineering task.

Full-Service Consultancy for production facilities

Full-Service Consultancy for production facilities/buildings containing light and medium heavy industry including the pharma industry (i.e., production buildings, cleanroom facilities, administration buildings, warehouses etc.). As AB Clausen is specialized within structural engineering, we will through interdisciplinary project management sub-contract across disciplines from a network of specialized sub-consultants and are thus able to handle all types of consultancy services. We handle the role as full-service consultant with the full responsibility for the delivery - including interdisciplinary project management of sub-consultants, design management in the design process and construction management. This is the core of our delivery model: Right resource, at the right time, for the right price, which we also phrase "Competence-based Consulting".

Support structures

Design of all kind of primary and secondary (equipment) supporting structures (i.e., crane supporting structures, conveyor supports, pipe/cable bridges, monorails etc.) for the industry and the energy sector.



Steel structures

Detailed design of all kind of steel structures for traditional buildings and structures including steel structures tendered for detailed design by the contractor/supplier.

Workshop design, steel structures

Preparation of workshop design (i.e., detailed design and 3D modeling of connections, assembly drawings, part drawings, material list, bolt list, part list, assembly list, shipping list, nc-files) and erection drawings for main and secondary steel structures. The workshop design preparation is based on sound steel structure connection design principles where the amount of full penetration butt welds is reduced to a minimum or even avoided if possible. The workshop design can be adjusted to specific workshop requests when informed beforehand. All steel structures are modelled in Tekla.

Platforms & galleries

Standard design of galleries and platforms according to industry standard ISO EN 14122 part 1 to 4 including railings, gratings, chequer plates, ladders, and staircase towers. For the benefit of our clients AB Clausen's optimized standard design can be utilized to reduce the overall construction costs.

Reinforcement design incl. bar bending schedules

Preparation of detailed reinforcement drawings for reinforced concrete structures including bar bending schedules and formwork drawings (if needed). Reinforcement can be modeled in 3D where necessary on request. However, the time consumption and the related cost associated with 3D modeling of reinforcement shall be evaluated in each case to determine if it gives value-for-money. Concrete structures are modelled in All Plan, Revit or Tekla depending on the type of structure.

Review of projects and project material

Review of industry and energy projects and project material prepared by others to identify possible savings which is often possible for AB Clausen's skilled engineers without compromising the function, the buildability, and the quality of the structures by adjusting the design basis, adjusting the design philosophy, or by identifying the optimal structural system. The possible saving is bigger the earlier the review is performed.

Specialist knowledge

In AB Clausen we have highly specialized engineers within design of underground structures including construction pits, geotechnical engineering, reinforced concrete structures, steel structures, timber structures, certified structural engineers for all construction classes required for construction projects falling into construction class KK2, KK3 and KK4, Building Information Modeling (BIM). These specialized engineers, which within their field of operation are among Denmark's best, can be involved in the industry projects as required.

1:1 sparring with clients

AB Clausen's highly skilled engineers can undertake ongoing 1:1 sparring with relevant employees inside the client's organization in discussing technical issues, identifying solutions, reviewing project material prepared by others and by performing actual design works as found necessary.

Seismic design

Design of structures subjected to seismic actions.



THE GOOD DESIGN PROCESS

In AB Clausen we understand the good design process necessary when designing industrial plants and production facilities to ensure the deliveries in terms of time, quality, and cost. Our employees' have documented comprehensive experience and knowledge in managing and designing complex industrial projects giving our clients a competent and reliable partner throughout the project lifetime. Examples of key items contributing to the good design process are given in the following:

Understand the plant process is vital

In AB Clausen we understand the importance of understanding the plant/factory process and operation to "talk the same language" initially when assisting the clients in developing the project. To succeed together with the clients, it is important to understand the complexities, the bindings, and the possibilities the plant process offers.

In AB Clausen we understand that for a plant or a production facility the process is the key player which will "dictate" the structure/building. But we also understand how to form the structures/buildings without compromising the function, the buildability, and the quality.

Parallel engineering is a must

In AB Clausen we understand that parallel engineering is often required in terms of developing and designing the structures in parallel with developing the plant layout to complete in due time. Often the vital equipment is not purchased or detailed at the stage of the detailed civil works design meaning that weights, dimensions, and locations may change during the project lifetime. Changes are a natural part of the projects. Parallel engineering including non-complete design input requires comprehensive managing of the project and procedures for handling of changes, which are often many and critical, are necessary.

Early involvement is the key to savings

In AB Clausen we find early involvement in industry projects important to be able to plan and design the structures in the most optimal way still respecting the plant process for the benefit of the

client. Often, we see that it is possible to design the structures in an optimal way if the structures are planned in parallel with preparing the overall plant layout instead of preparing the layout without applying structural knowhow which will often lead to unnecessary and costly dictating of the structures. We see a huge cost saving potential waiting to be explored if the structural engineers are involved in the relevant early phase which could be a sales phase or pre-engineering phase. Even though the plant process is the most important part when preparing the layout, the civil works shall not be neglected as the civil works often account for an important part of the total construction costs depending on the type of the plant.

Invest in the design phase to reduce the total cost

In AB Clausen we focus on the total cost for the completed project meaning the sum of the design fee and the construction costs. We find that investments in the design phase introduce important savings in the construction costs which by far exceeds the increased costs in the design fee related to the extra effort put into the design phase. We recommend our clients to invest in the design phase and not necessarily to choose the consultant with the lowest design fee but the consultant having demonstrated knowhow how to reduce the construction costs.

Optimization of structures. What does it mean?

When we in AB Clausen have a declared goal to focus on the construction costs, we invest time and money in optimizing the structures. In AB Clausen optimization does not mean that the structures are that highly utilized that even a minor change in geometry or loading means that the structure become overutilized. Good optimization still offering a robust design together with big savings in materials leading to a less costly structure also having a smaller Co2 footprint is in AB Clausen archived by: Finding the "right" solution, utilizing the interaction between different nearby structures, utilizing the interaction between different materials and structural components, choosing the correct steel sections (seems easy, but is not done in many structures built) and choosing the correct

reinforced element cross sections considering the cost for the individual costs for the concrete, for the reinforcement and for the formwork depending of the country in which the plant shall be built.

Experienced project- & design managers

In AB Clausen we understand that it is vital for the industrial clients that their consultants possess a demonstrated experience in performing design for industrial plants to have a guarantee on the performance where a huge number of drawings often must be prepared in a short time. For that reason, industry projects will in AB Clausen always be managed by experienced project- and design managers having a solid and documented many years' experience in and knowledge about managing and designing complex industrial structures. The design manager will manage the team of highly competent engineers.

Agreeing on design conditions is vital

In AB Clausen we have a pre-defined procedure how to clarify and agree in all important design conditions and design assumptions together with our clients. This is essential for industrial projects as the design and load conditions are often different from what is seen in traditional buildings and often highly project and industry dependent. It is important that all client requirements are communicated and incorporated in the project, also the requirements or conditions which are not (yet) known by the client. It is ensured by AB Clausen that all design conditions are discussed in detail prior to commencement of the design. All design conditions are documented in the design condition document which is continuously updated as the project progress.

Strategic outsourcing to reduce costs

In AB Clausen we believe in strategic outsourcing of design works to well-established foreign based highly skilled partner companies which we have worked together with for many years. Outsourcing of design works are relevant for well-defined parts of the different projects to increase the competitiveness for the benefit of AB Clausen and our clients. The collaboration with or network of different partner companies also give us the necessary power to hand over detailed design in a continuous flow often required in complex industrial projects. Our clients will always have one point of contact only – The selected project manager.

We follow clients' internal procedures

In AB Clausen we understand and respect that many industry clients have their own internal systems and procedures which need to be followed and respected.

Steel structures

When defining the scope of work for steel structures together with our clients we will for cost reasons recommend either that we prepare the design and 3D modeling of all steel members and prepare a detailed connection design force report allowing the contractor to design and 3D model the connections or that we prepared the complete design and 3D modeling of all members and connections (and eventual prepare the workshop drawings as well). This is to avoid according to us worthless 2D drafting of connections.

